SMART SCHOOL BUS MONITORING SYSTEM USING IOT

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ABSTRACT

This paper presents an IoT-based approach of school bus tracking, with a focus on increasing child safety and providing real-time communication with parents. The system uses RFID tags as the primary means of verification, followed by a secondary verification process using cameras. The camera captures images of students and checks them against previously stored images, The system uses ESP8266 to connect GPS, RFID, and Firebase servers to the cloud via WiFi, enabling seamless integration and efficient data transmission. Introducing a Smart School bus security system using IoT offers many benefits, including increased student safety, increased accountability, and reduced practices costs and better communication between parents, schools and transport agencies.

Keywords: Student Verification, Vehicle Monitoring, Internet Of Things(IOT).

I.   INTRODUCTION

In an age marked by rapid technological advancements, ensuring the safety and security of our most precious assets, our children, is a paramount concern. The daily commute to and from school is a vital part of a child's routine, and it is essential that this journey is not only efficient but also safeguarded with cutting-edge measures. The "Smart School Bus Safety System using IoT" project emerges as a groundbreaking solution that leverages the power of Internet of Things (IoT) technology to address this critical issue.

The "Smart School Bus Monitoring System using IoT" project represents a significant step forward in ensuring child security during school transportation. By harnessing IoT technologies, it empowers parents, guardians, and school administrators with the means to protect and monitor our children as they embark on their educational journey, reaffirming our commitment to their well-being in this rapidly evolving world.

II.   LITERATURE REVIEW

A Sai Aishwarya.Et.al [1] developed "IOT Based Smart School Bus Monitoring and Notification System" (2020) In this paper, they used SQLyog and Visual Studio to build a website and a mobile application that will allow parents and schools to track the bus location as well as monitor children using the fingerprint sensor and GPS module controlled by the NodeMCU microcontroller. The fundamental idea behind this existing system is that using a website and application made by them, both parents and admins can keep track of their children and monitor the bus.

Nada Abdul Al-Balushi.Et.al [2] implemented "Transport Safety Mechanism of School Children Using IOT based Smart System" (2020) The IoT smart transportation system for a children's school is presented in this research study. The system includes IR sensors to determine the number of students, an RFID card and reader to read student data and keep track of attendance, and a MQ3 sensor to detect alcohol and assure the driver's safety. It also includes a smartphone application for receiving notifications and messages, as well as the time student boarded the school bus and exited the bus. You can also use the most recent coordinates to track the bus using Google Maps. This system uses Things Speak a public cloud developed for IOT.

Dr. M. V. Vyawahare.Et.al [3] implemented "IOT Based School Bus Monitoring and Security System" (2019) In this system A vehicle monitoring system is used to track a bus's travel from any location at any particular time. The proposed system utilizes a technique that integrates a smartphone app with a microcontroller. The devices used in this system are NodeMCU Mega, RFID reader, GSM module and MQ3 sensor to monitor, track and send notification alerts to parents and school. This system uses Blynk application to monitor and run the application.

Palvi Shelke.Et.al [4] wrote "Smart Tracking System for School Buses for Ensuring Child Security using IoT Implications and GPS Technology" (2019) This result recommends an android-based solution that allows

parents to monitor their children's location in real time via IoT applications. GPS technology can be utilized to track the child's whereabouts, and a biometric identification system is included into the system to identify the child's existence. Additionally, if the driver or bus worker has consumed alcohol or over speed the sensors implemented in the bus will notify the school authorities.

III.   PROPOSED SYSTEM

System Architecture

The proposed society security system consists of the following major components:

- ESP 8266: The ESP8266 microcontroller serves as the primary component. It real-time attendance verification, GPS-based tracking, and communication with GSM modules. This central component integrates seamlessly with RFID cards, cameras, and other peripherals, forming the backbone of the system that ensures child safety during school transportation through advanced IoT technology.

- RFID Reader: The RFID reader is utilized to record the in-time and out-time of students, who use RFID tags to register their attendance, providing an efficient tracking system.

- ESP32-CAM : The ESP32-CAM is used for capturing images of students and transmitting them to their parents via the Telegram messaging platform.

- Firebase: Firebase is utilized to retrieve real-time data from the model and seamlessly transmit it to the application for effective and up-to-date information delivery.

- GPS MODULE : GPS technology is used to monitor the real-time location of a bus, enabling accurate and dynamic tracking of its whereabouts..

- GSM MODULE : The GSM module is used to deliver SMS messages to parents' mobile numbers, and it is activated when the driver presses a designated switch, ensuring timely communication and updates.

- LCD DISPLAY : An LCD display is used to showcase pertinent information, primarily serving as a visual interface for drivers to monitor and interpret their actions.

Working

- The project utilizes a NodeMCU ESP8266, connected to various components including an EM18 module, ESP32-Camera, GPS, switches, LCD display, and GSM module.

- Drivers initiate notifications to parents by pressing switches, signaling the bus's imminent arrival at the parent's location.

- Students use RFID cards to register attendance via the EM18 module, with data seamlessly transmitted to Firebase and subsequently fetched by the application.

- Upon RFID card tap, the ESP32-Camera captures the student's image, ensuring security, and sends it to parents via Telegram.

- Real-time location tracking is enabled through the embedded GPS module for enhanced monitoring.

- The GSM module sends SMS notifications to parents, indicating whether their child is on board or has exited the bus.

- An LCD display is provided for the driver to conveniently view and confirm their actions.

- During drop-offs, students use their RFID cards again, updating the out-time data, which is processed through Firebase and fed into the application for comprehensive tracking of in-time/out-time records.

- **Block Diagram**
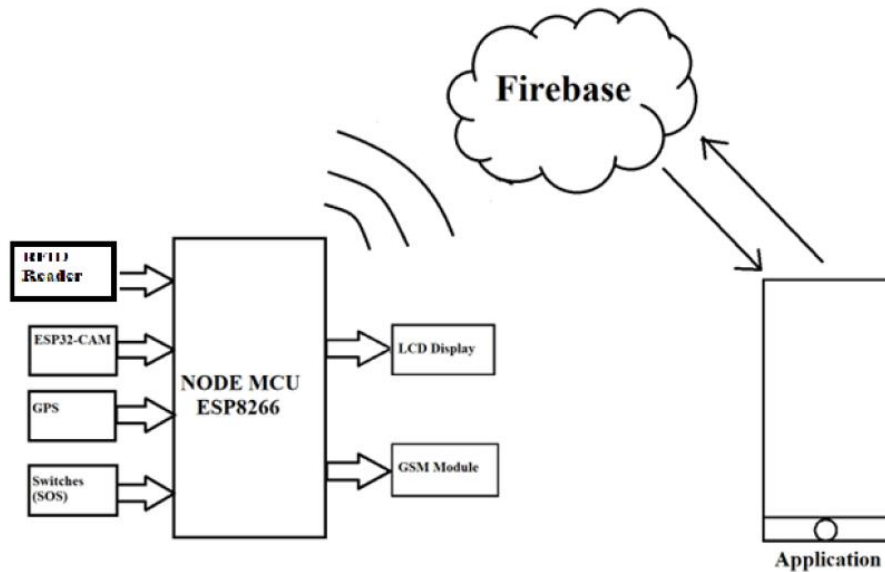
IV.   CONCLUSION

In summary, This technology uses Real Time Bus Tracking to track the bus location constantly in real time. GPS device is installed on the bus which reads the location of buses in small time interval. This data is passed to a microprocessor which analyses and stores the data on web servers. Real time data can be now displayed to the user through web servers. An RFID technology are also added for providing information on the number of passengers in a bus at any time and provides information on the number of vacant seats. This technology provides real time information on bus location and passenger which helps the travelers to decide if they need to wait for the bus or not. Hence it reduces the waiting time of passengers by the help of Global Positioning System (GPS). Estimated time of arrival is also provided to the users along with the current location. The estimated time of arrival is calculated and is provided to the user through mobile application.

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V.   REFERENCES

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